

Amendment of Claims  
under Article 34

ART 34 A101

## C L A I M S

1. (amended) A feedback control method of performing  
disturbance recovery control by giving a manipulated variable to a controlled system so as to make a controlled variable recover to a set point at the time of application of a disturbance, characterized by comprising:
  - the step of dividing a response process of disturbance recovery control into three stages including a follow-up phase, a convergence phase, and a stable phase;
  - the first phase switching step of switching to the follow-up phase at a disturbance application detection time point as a start time point of the follow-up phase;
  - the follow-up phase manipulated variable determination step of continuously outputting a manipulated variable which makes the controlled variable follow up the set point in the follow-up phase;
  - the second phase switching step of switching to the convergence phase at a disturbance recovery control elapsed time point, as a start time point of the convergence phase, at which the controlled variable does not exceed the set point in the follow-up phase;
  - the convergence phase manipulated variable determination step of continuously outputting a

26 manipulated variable which makes the controlled variable  
27 converge near the set point in the convergence phase so  
28 as to prevent a control response waveform from being  
29 disturbed before and after a switching time point  
30 between the follow-up phase and the stable phase;

31 the third phase switching step of switching to  
32 the stable phase at a time point, as a start time point  
33 of the stable phase, at which a preset state is reached  
34 in the convergence phase; and

35 the stable phase manipulated variable  
36 determination step of continuously outputting a  
37 manipulated variable which makes the controlled variable  
38 stable at the set point in the stable phase.

2. A feedback control method according to  
2 claim 1, characterized in that the first phase switching  
3 step comprises the step of setting a time point, as the  
4 start time point of the follow-up phase, at which it is  
5 confirmed on the basis of a deviation between a set  
6 point and a controlled variable that a disturbance has  
7 been applied.

3. A feedback control method according to  
2 claim 1, characterized in that the first phase switching  
3 step comprises the step of setting a time point, as the  
4 start time point of the follow-up phase, at which a  
5 phase switching signal is input from an external unit  
6 which notifies application of a disturbance.

4. A feedback control method according to

2 claim 1, characterized in that the second phase  
3 switching step comprises the step of calculating a  
4 predicted value of a remaining time for attainment which  
5 is a time taken for a current controlled variable to  
6 reach the set point in the follow-up phase, on the basis  
7 of a deviation between the set point and the controlled  
8 variable and a controlled variable change ratio, and the  
9 step of setting a time point, as the start time point of  
10 the convergence phase, at which the calculated predicted  
11 value of the remaining time for attainment becomes  
12 smaller than a preset time index.

5. A feedback control method according to  
2 claim 1, characterized in that the third phase switching  
3 step comprises the step of setting a time point, as the  
4 start time point of the stable phase, at which a preset  
5 time index has elapsed.

6. A feedback control method according to  
2 claim 1, characterized in that the follow-up phase  
3 manipulated variable determination step comprises the  
4 step of continuously outputting a preset manipulated  
5 variable.

7. A feedback control method according to  
2 claim 1, characterized in that the convergence phase  
3 manipulated variable determination step comprises the  
4 step of continuously outputting a preset manipulated  
5 variable.

8. (amended) A feedback control device for

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dividing a

2 response process of disturbance recovery control into  
3 three stages including a follow-up phase, a convergence  
4 phase, and a stable phase and performing disturbance  
5 recovery control by giving a manipulated variable to a  
6 controlled system so as to make a controlled variable  
7 recover to a set point at the time of application of a  
8 disturbance, characterized by comprising:

9           a first phase switching unit which switches to  
10 the follow-up phase at a disturbance application  
11 detection time point as a start time point of the  
12 follow-up phase;

13           a second phase switching unit which switches  
14 to the convergence phase at a disturbance recovery  
15 control elapsed time point, as a start time point of the  
16 convergence phase, at which the controlled variable does  
17 not exceed the set point in the follow-up phase;

18           a third phase switching unit which switches to  
19 the stable phase at a time point, as a start time point  
20 of the stable phase, at which a preset state is reached  
21 in the convergence phase;

22           a first manipulated variable determining unit  
23 which continuously outputs a manipulated variable which  
24 makes the controlled variable follow up the set point in  
25 the follow-up phase;

26           a second manipulated variable determining unit  
27 which continuously outputs a manipulated variable which

28 makes the controlled variable converge near the set  
29 point in the convergence phase so as to prevent a  
30 control response waveform from being disturbed before  
31 and after a switching time point between the follow-up  
32 phase and the stable phase; and  
33 a third manipulated variable determining unit  
34 continuously outputs a manipulated variable which makes  
35 the controlled variable stable at the set point in the  
36 stable phase.

9. A feedback control device according to  
2 claim 8, characterized in that said first phase  
3 switching unit sets a time point, as the start time  
4 point of the follow-up phase, at which it is confirmed  
5 on the basis of a deviation between a set point and a  
6 controlled variable that a disturbance has been applied.

10. A feedback control device according to  
2 claim 8, characterized in that said first phase  
3 switching unit sets a time point, as the start time  
4 point of the follow-up phase, at which a phase switching  
5 signal is input from an external unit which notifies  
6 application of a disturbance.

11. A feedback control device according to  
2 claim 8, characterized in that said second phase  
3 switching unit calculates a predicted value of a  
4 remaining time for attainment which is a time taken for  
5 a current controlled variable to reach the set point in  
6 the follow-up phase, on the basis of a deviation between

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7 the set point and the controlled variable and a  
8 controlled variable change ratio, and sets a time point,  
9 as the start time point of the convergence phase, at  
10 which the calculated predicted value of the remaining  
11 time for attainment becomes smaller than a preset time  
12 index.

12. A feedback control device according to  
2 claim 8, characterized in that said third phase  
3 switching unit sets a time point, as the start time  
4 point of the stable phase, at which a preset time index  
5 has elapsed.

13. A feedback control device according to  
2 claim 8, characterized in that said manipulated variable  
3 determining unit continuously outputs a preset  
4 manipulated variable.

14. A feedback control device according to  
2 claim 8, characterized in that said second manipulated  
3 variable determining unit continuously outputs a preset  
4 manipulated variable.